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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

# (54) Paper Sheet Guiding Cylinder for a Printing Machine

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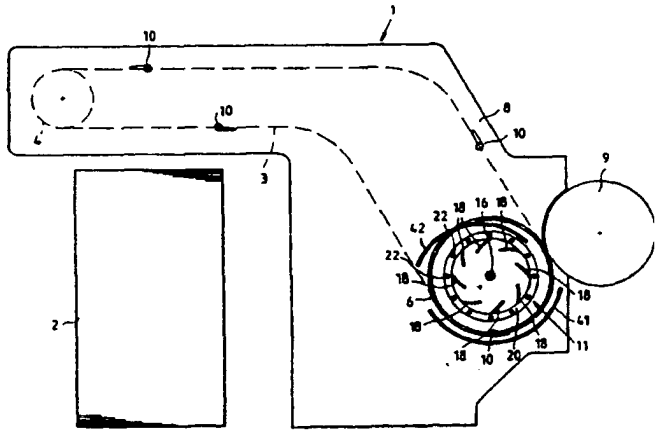
(54) Title: PAPER SHEET GUIDING CYLINDER FOR A PRINTING MACHINE

(54) Bezeichnung: BOGENFÜHRUNGSZYLINDER EINER DRUCKMASCHINE

(57) Abstract

A paper sheet guiding cylinder for a printing machine is mounted in the machine side frames, is drivingly linked to the printing machine drive, and has an outer casing provided with through holes. Means are provided for blowing air into the paper sheet guiding cylinder and means located inside the paper sheet guiding cylinder deflect the blown air in the direction of the cylinder casing. In order to deflect the blown air, a radial ventilator is rotatively mounted in the paper sheet guiding cylinder (11) and is linked to driving means which are independent from the paper sheet guiding cylinder. Through holes are provided in the side walls (20) of the paper sheet guiding cylinder (11).




(57) Zusammenfassung

Bogenführungszylinder einer Druckmaschine, der in den Maschinenseitengestellen gelagert ist und für den eine Antriebsverbindung zum Druckmaschinenantrieb beste mit einer mit Durchgangsöffnungen versehenen Mantelfläche und mit Mitteln zum Zuführen von Blasluft in den Bogenführun zylinder und mit Mitteln zum Umlenken der Blasluft in Zylindermantelrichtung im Inneren des Bogenführungszylinders, wo zum Umlenken der Blasluft im Bogenführungszylinder (11) ein Radialventilator drehbar gelagert ist, der mit von dem Bogenf rungszylinder unabhängigen Antriebsmittel verbunden ist, und wobei daß in den Seitenwänden (20) des Bogenführungszylind (11) Durchgangsöffnungen vorgesehen sind.

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**Paper sheet guiding cylinder for a printing machine**

The invention relates to a paper sheet guiding cylinder for a printing machine that is mounted in the machine side frames, is drivingly linked to the printing machine drive, and has an outer casing provided with through holes. Means are provided for blowing air into the paper sheet guiding cylinder and means located inside the paper sheet guiding cylinder deflect the blown air in the direction of the cylinder casing.

Paper sheet guiding cylinders are known in the art to be used in printing machines to transport printed paper sheets between the printing units or in the delivery section. The paper sheet should also be guided stably and smear-free with printed sheets whose printed side is oriented towards the outer casing of the paper sheet guiding cylinder. The outer casings are also known in the art to be provided with expensive special coatings. The paper sheet guiding cylinders are also known in the art to be provided with blown air passed from their interior to the outer casing to the exterior by means of blow jets oriented outwards and connected non-rotatively to the paper sheet guiding cylinder and with a complex external blown air supply. The blown air jets only cover a certain part of the paper sheet guiding area. In order to cover a larger part of the paper sheet guiding area it is necessary to arrange several rows of blow jets in close succession one after the other. The external blown air supply requires a large number of sealing means, air supply means and a complex blown air control system.

From DE-OS 36 38 452 A1 it is also disclosed to connect air blades for deflecting the blown air to the exterior inside a paper sheet guiding cylinder non-rotatively to the paper sheet guiding cylinder. While it is possible by means of these air

blades to adequately supply the cylinder surface with an air cushion at high speeds such that the printed side of a paper sheet does not come into contact with the outer casing of the paper sheet guiding cylinder and hence to largely avoid smearing effects, when printing conditions are altered, and at low speeds in particular, the air supply is not enough to prevent further touching contacts. Therefore wide working areas, for example the proof printing or production run printing of highly accurate special orders that are usually printed at slow speeds, cannot be transported reliably free from smears. If the machine stops
suddenly the paper sheets can simply collapse under their own weight and in critical areas can even stick to the outer casings of the paper sheet guiding cylinder. On the other hand at very high speeds that go beyond the narrow speed range of stable smear-free paper sheet guiding the air cushion easily becomes too thick and also because of breakaway effects of the flow, the paper sheets can flutter and also contact paper sheet guiding surfaces with their printed sides.

The invention is based on the problem of achieving a stable guiding of printed paper sheets with simple means.

According to the invention the problem is achieved by an embodiment of the paper sheet guiding cylinder in accordance with the features of Claim 1. The radial ventilator that is rotatively mounted in relation to and driven independently of the paper sheet guiding cylinder facilitates stable paper sheet guiding over the full working area. Both at machine stop and also at very high speeds an air cushion necessary for stable paper sheet

guiding can be set individually because of the radial ventilator speed control that is independent from the paper sheet guiding cylinder. Even in the event of a very abrupt machine stop the printed paper sheet side can be prevented from sticking to the paper sheet guiding cylinder. Stable paper sheet guiding is guaranteed over the full paper sheet guiding area of the paper sheet guiding cylinder. The through holes in the front walls of the paper sheet guiding cylinder facilitate an adequate air supply without additional external complexity. The large amount of maintenance and assembly work involved by external air supply means becomes redundant. Stable paper sheet guiding is achieved by simple means. No additional provision of space for complex air supply means is necessary. The complexity of the control system for controlling the radial ventilator is low compared with the known control systems for external air supply. The reduction in smearing effects leads to a reduction in paper wastage, an improvement in the quality of the printed paper sheets because of the absence of ink carry-over onto to subsequent paper sheets and the reduction in the amount of cleaning needed for the paper sheet guiding cylinder.

The embodiment of the invention in accordance with the feature of Claim 2 facilitates an additional improvement in the supply of air to the radial ventilator, improving the adjustability of the desired cushion of air and the stable paper sheet guiding. Owing to the improved efficiency of the radial ventilator it can be used more energy efficiently, the driving means can have a lower power and costs and space requirements for the driving means can be reduced.

The embodiment of the invention in accordance with the feature of Claim 3 facilitates an additional improvement in the supply of air.

The embodiment of the invention in accordance with the features of Claim 4 facilitates a stable ven supply of air over the full width of the paper sheet guiding cylinder.

The embodiment of the invention in accordance with the feature of Claim 5 facilitates a stable ev n supply of blown air over the full width of the paper sheet guiding cylinder with particularly simple preferred means.

The device of the invention in accordance with the features of Claim 6 facilitates a particularly simpl preferred driving connection for the radial ventilator. The driving means can be arranged completely outside the machine side wall and do not therefore obstruct the already confined space between the machine front walls. The driving means are easily accessible. The control circuit for the driving means can be designed to be particularly simple.

The form of the invention in accordance with the features of Claim 7 constitutes a further embodiment of the driving connection.

The form of the invention in accordance with the feature of Claim 8 constitutes a further tensioning of the transported paper sheets by the blown air moving counter to the direction of transport of the paper sheets. This proves to be especially beneficial for the short-term machine stop in particular.

In the preferred form of embodiment the direction of rotation of the radial ventilator in accordance with the feature of Claim 9 is designed to be reversible. This facilitates the optimum matching of the supply of blown air to the print job profile. In particular the change from very thin paper sheets to very thick paper sheets and vice versa can be carried out particularly

stably with this form of embodiment.

The invention is explained in further detail below by reference to the design examples for a paper sheet guiding cylinder in the chain arm of a paper sheet printing machine illustrated in Figures 1 to 6.

These show:

Fig. 1 Elevation of a chain delivery device with motor for the radial ventilator arranged outside the machine side frames.

Fig. 2 Plan view of the design example in accordance with Fig. 1

Fig. 3 Elevation of a chain delivery device with motor arranged between the side frames

Fig. 4 Plan view of the design form in accordance with Fig. 3

Fig. 5 Elevation of a further design example driven from the exterior

Fig. 6 Plan view of the design form in accordance with Fig. 5

*Figs. 1 and 2 illustrate a delivery device* 1 of a paper sheet rotary offset printing machine in which printed paper sheets from the printing cylinder 9 of the last printing unit are accepted by gripper rails 10 attached to chains 3 and are transported over a delivery stack 2 where they are stacked. The gripper rails are carried on two chains 3 between the side frames 7 and 8. In the area of the arm drum 11 the chains 3 are each guided continuously over sprockets 5 and 6. Sprocket 5 is attached on a stub shaft 13 that is rotatively mounted in side wall 7 and on

whose extension outside the side frame 7 a sprocket 12 is attached which is connected with the printing machine drive that is not shown any further. The sprocket 6 is also rotatively mounted on a stub shaft 14 in the machine side frame 8 concentric with sprocket 5. The stub shaft 14 is designed to be a hollow shaft. A shaft 16 is rotatively mounted concentric to the stub shafts 13 and 14 and is extended through the hollow stub shaft 14 to the exterior. A motor 15 is mounted on the extension outside the machine side frame 8 and is supported against the machine side frame in a known manner. The shaft 16 runs transversely to the paper sheet transport direction and is rotatively mounted by its other shaft journal in stub shaft 13. In the middle of the machine width on shaft 16 a circular carrier flange 17 is mounted in whose outer perimeter area evenly spaced deflector blades 18 and 19 for radial ventilation are attached on both sides towards the machine side frames 7 and 8 over the circumference of the carrier flange 17. The deflector blade plates 18 and 19 extend towards the exterior over the full transport width and are provided at their extremity with annular plates 25 and 26 oriented concentrically to the shaft 16. Circular flanges 20 and 21 are also attached on the stub shafts 13 and 14 between the sprockets 5 and 6. Towards the centre of the machine inlet nozzles 24 are mounted on the flanges 20 and 21 oriented concentrically to shaft 16. These nozzles connect the ring channel 43 located within the deflector blades 19 between deflector blades 19 and shaft 16 with the atmosphere by means of through holes 23 distributed over th circumference of flanges 21 and 20. Crossbars 22 are also attached in the flanges 20 and 21 spaced around their circumference and at a greater radius than that of the deflector blades 19. These crossbars extend across the full width between the two flanges 20 and 21.

Paper sheets that are transferred from printing cylinder 9 to gripper rails 10 on the continuous chains 10 (sic) are transported by the gripper rails 3 (sic) between guide plates 41 that are mounted in the side frames 8, 7 and the outer face of the crossbars 22 on delivery drum 11. To this end the chains 3 are driven by the printing machine drive across sprocket 12, stub shaft 13, flange 20, crossbars 22, flange 21 and sprockets 5 and 6. Independently of this the deflector blades 18 and 19 are driven by means of motor 15 across shaft 16 and flange 17. The deflector blades on the radial ventilator draw suction air through the through holes 23 in flanges 20 and 21 across the inlet nozzles 24 into the channels 43 and discharge it radially and circumferentially as blown air to the exterior. By this means an adequate cushion of air for stable paper sheet guiding can be achieved over the entire circumference of the delivery drum. Desired operating profiles can be set steplessly by the aid of the motor controller for the motor 15.

It is possible to use a motor 15 that is variable in its direction of drive. By this it is if necessary possible to orient blown air counter to the direction of transport of the paper sheets as a result of which the trailing edge of the paper sheet is slightly tensioned against the leading edge of the paper sheet that is held by the gripper rails as a result of which flutter effects can also be prevented. Even in the event of a machine stop the motor 15 can continue to drive the deflector blades 19 and 18, thereby sustaining the cushion of air.

To improve efficiency it is also conceivable to attach an additional guide plate 42 above the delivery drum between the machine side frames, for example to isolate the remaining delivery area from

the blown air and also the transport area of the printing cylinder.

Figures 3 and 4 illustrate another embodiment of the invention. The sprockets 5 and 6 are stationary-fitted on a shaft 35 that is rotatively mounted in the machine side frames 7 and 8 and runs transverse to the paper sheet transport direction. The shaft 35 is extended through machine side frame 7 towards the exterior and is in connection with the printing machine drive by means of a sprocket 12 that is mounted on it. Between sprockets 5 and 6 a hollow shaft 32 is rotatively mounted on shaft 35 and coaxially to it. Two flanges 30, 31 are mounted on the hollow shaft 32 in the middle of the machine width. At their ends facing the side frames 7 and 8 deflector plates 28 and 29 are mounted for radial ventilation, coaxially to shaft 35 and evenly spaced over the outer circumference of flanges 30 and 31. At their extreme end these are in turn attached to annular plates 25, 26 oriented coaxially to the shaft 35. Between annular plate 26 and sprocket 5 the hollow shaft 32 is connected by means of a drive belt 33 to a driven shaft 34 which is in turn connected to an independent drive motor. Here again the radial ventilator formed by the defl ctor plates 28, 29 suck air from atmosphere between sprockets 5, 6 and annular plates 25, 26 through channel 43 formed between the deflector plates 28, 29 and hollow shaft 32 and discharge it to atmosphere as blown air in the direction of the paper sheet guiding plane.

Instead of drive belt 33 it is also conceivable to use a chain or sprocket drive.

With the embodiment of Fig. 1 and 2 it is equally conceivable to

use rectangular section crossbars 36 as illustrated in Figures 5 and 6 instead of the circular section crossbar 22. The crossbars can also be matched to the aerodynamic requirements.

For easier assembly as illustrated in Figure 6, the configuration of the deflector plates, an example of which was shown by way of the second embodiment in Figures 3 and 4, can also be carried out with the aid of two flanges 37 and 38 that are shown an exaggerated distance apart. At the outer sides of flanges 37 and 38 are attached the carrier plates 30, 39, 40 within whose perimeter area the deflector plates 18, 19 are mounted as on the carrier plates 30, 31 in Fig. 4. This configuration is conceivable both with the drive in accordance with the first embodiment of Fig. 1 and 2, as is illustrated in Fig. 6, and in the second embodiment in which flanges 37 and 38 are mounted on the hollow shaft 32.

**AMENDED CLAIMS**

[received by the International Bureau on 19 January 1994 (19.01.94), original claims 1, 3, 4 and 5 amended; other claims unchanged (4 pages)]

1. A paper sheet guiding cylinder for a printing machine that is mounted in the machine side frames, is drivingly linked to a printing machine drive, and has an outer casing provided with through holes. Means are provided for blowing air into the paper sheet guiding cylinder and means located inside the paper sheet guiding cylinder deflect the blown air inside the paper sheet guiding cylinder towards the cylinder casing,

   characterised by the fact

   that in order to supply blown air into the paper sheet guiding cylinder (11) and to deflect the blown air inside the paper sheet guiding cylinder (11) towards the cylinder casing, there is provided coaxially to the axis of the paper sheet guiding cylinder (11) a rotatively mounted radial ventilator that at its end faces connects with the ambient air across through hol s (23) provided in front walls (20, 21) of the paper sheet guiding cylinder (11), has ventilator blades (18, 19, 28, 29) arranged concentrically about the axis of the paper sheet guiding cylinder (11) and running along the paper sheet guiding cylinder (11), and is drivable by means of driving means (15) with adjustable speed that are independent from the paper sheet guiding cylinder (11).

2. A paper sheet guiding cylinder for a printing machine according to the features of Claim 1,

   characterised by the fact

   that inlet nozzles (24) are connected non-rotatively with the radial ventilator on at least one of the sides of the radial ventilator that face the front walls (20, 21) of the paper sheet guiding cylinder (11).

3. A paper sheet guiding cylinder for a printing machine according to the features of Claim 2,

characterised by the fact

that within the ventilator blades (18, 19, 28, 29) of the radial ventilator that are arranged in a ring concentric to the cylinder axis there is provided annularly a cylindrical channel (43) that runs axially and that terminates axially
in the inlet nozzle (24).

4. A paper sheet guiding cylinder for a printing machine according to the features of Claim 3,

characterised by the fact

that the ventilator blades of the radial ventilator are mounted between two circular carrier plates of the ventilator on these,
that the carrier plates are mounted concentrically on the shaft (16, 32) of the radial ventilator,
that the shaft (16, 32) is mounted concentrically in the paper sheet guiding cylinder,
that the carrier plates are each provided with inlet nozzles in order to supply blown air to the channel (43).

5. A paper sheet guiding cylinder for a printing machine according to the features of Claim 3,

characterised by the fact

that concentrically to the paper sheet guiding cylinder (11) and in it a shaft (16, 32) is rotatively mounted,
that in the middle of the width of the paper sheet guiding cylinder (11) one or two closely interspaced carrier plates (17, 30, 31, 39, 40) are mounted concentrically on the shaft (16, 32),
that on the side faces of the one (17) or on the opposite sides of both the carrier plates (30, 31, 39, 40) are mounted the ventilator blades (19, 28, 29) that each run

parallel to the shaft axis and that are arranged concentrically about the shaft (16, 32).

6. A paper sheet guiding cylinder for a printing machine according to the features of one or more of the preceding Claims,

characterised by the fact

that the radial ventilator is provided with a drive shaft (16) by which it is mounted concentrically to the paper sheet guiding cylinder (11) and that this shaft is extended on one side of the paper sheet guiding cylinder by a shaft journal (14) of the paper sheet guiding cylinder (11) through the machine side wall to the exterior and that the extension reaching through to the exterior is drivingly linked to driving means that are outside the machine side wall and controllable independently from the printing machine drive.

7. A paper sheet guiding cylinder for a printing machine according to the features of one or more of Claims 1 to 5,

characterised by the fact

that the paper sheet guiding outer casing of the paper sheet guiding cylinder (11) is provided at least over the paper sheet guiding angular area of the paper sheet guiding cylinder (11), with gripper rails (10) of the gripper chains (3) that pass around the front walls of the paper sheet guiding cylinder (11),
that the radial ventilator possesses a shaft (32) that is mounted concentrically to the sprockets (5, 6) and is drivingly linked to independently controllable driving means that are arranged on an interior side of one machine side wall between the two spans of a chain.

8. A paper sheet guiding cylinder for a printing machine from one or more of Claims 1 to 7,

characterised by the fact

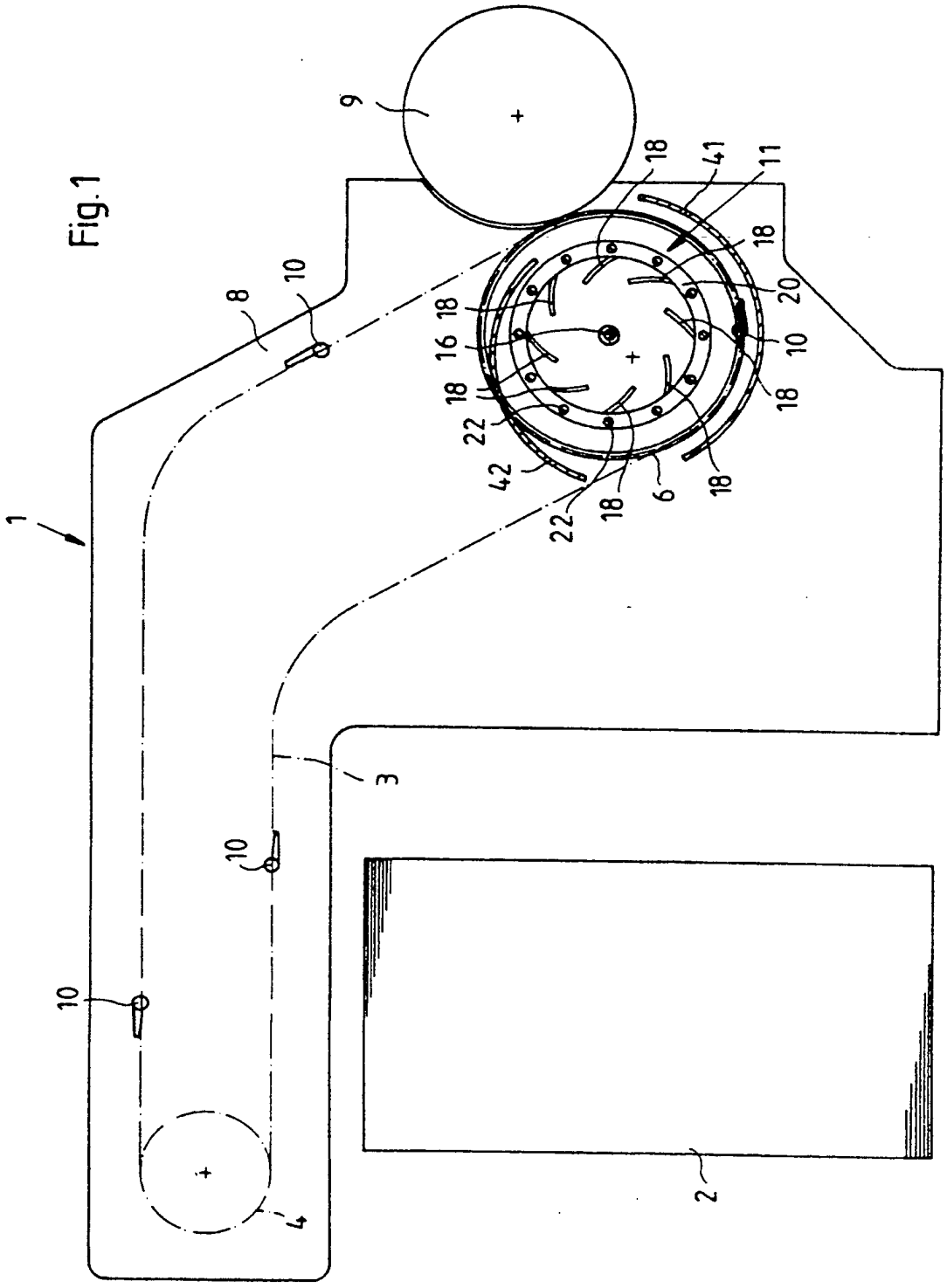
that the direction of rotation of the radial ventilator is variable.

9. A paper sheet guiding cylinder for a printing machine from one or more of Claims 1 to 7,

characterised by the fact

that the direction of rotation of the radial ventilator is contrary to the direction of rotation of the paper sheet guiding cylinder (11).

Fig.1



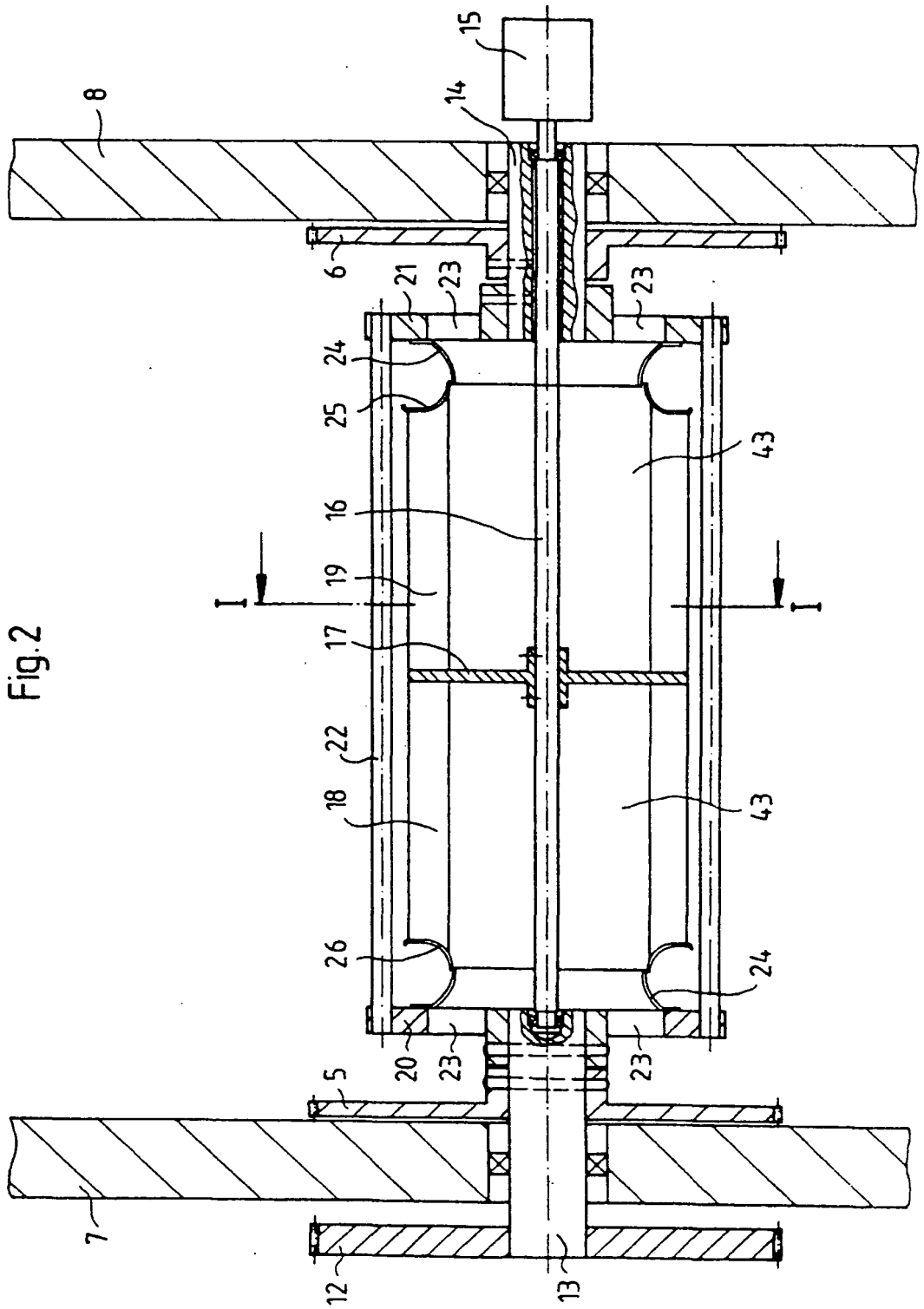
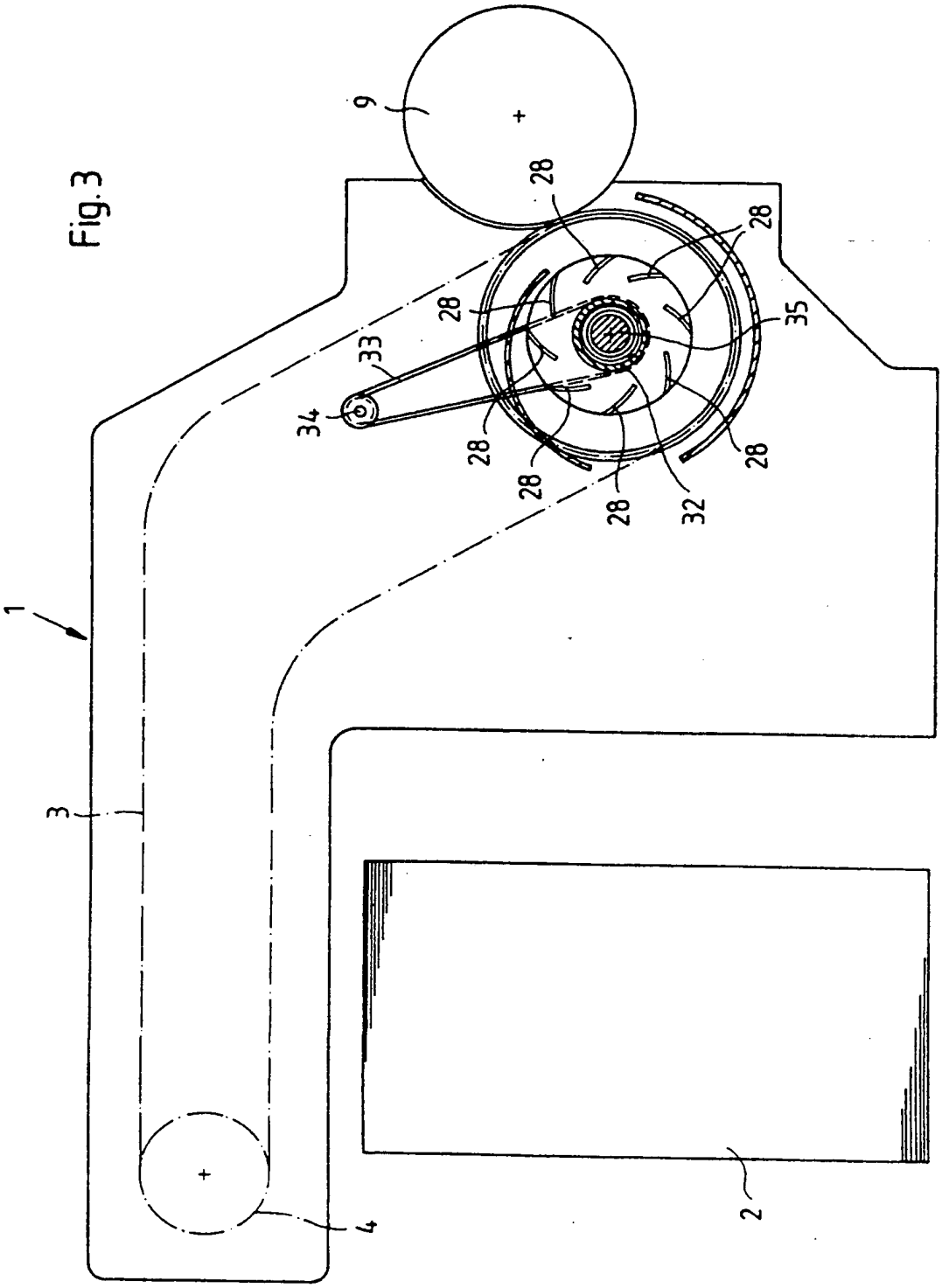



Fig.2

Fig.3



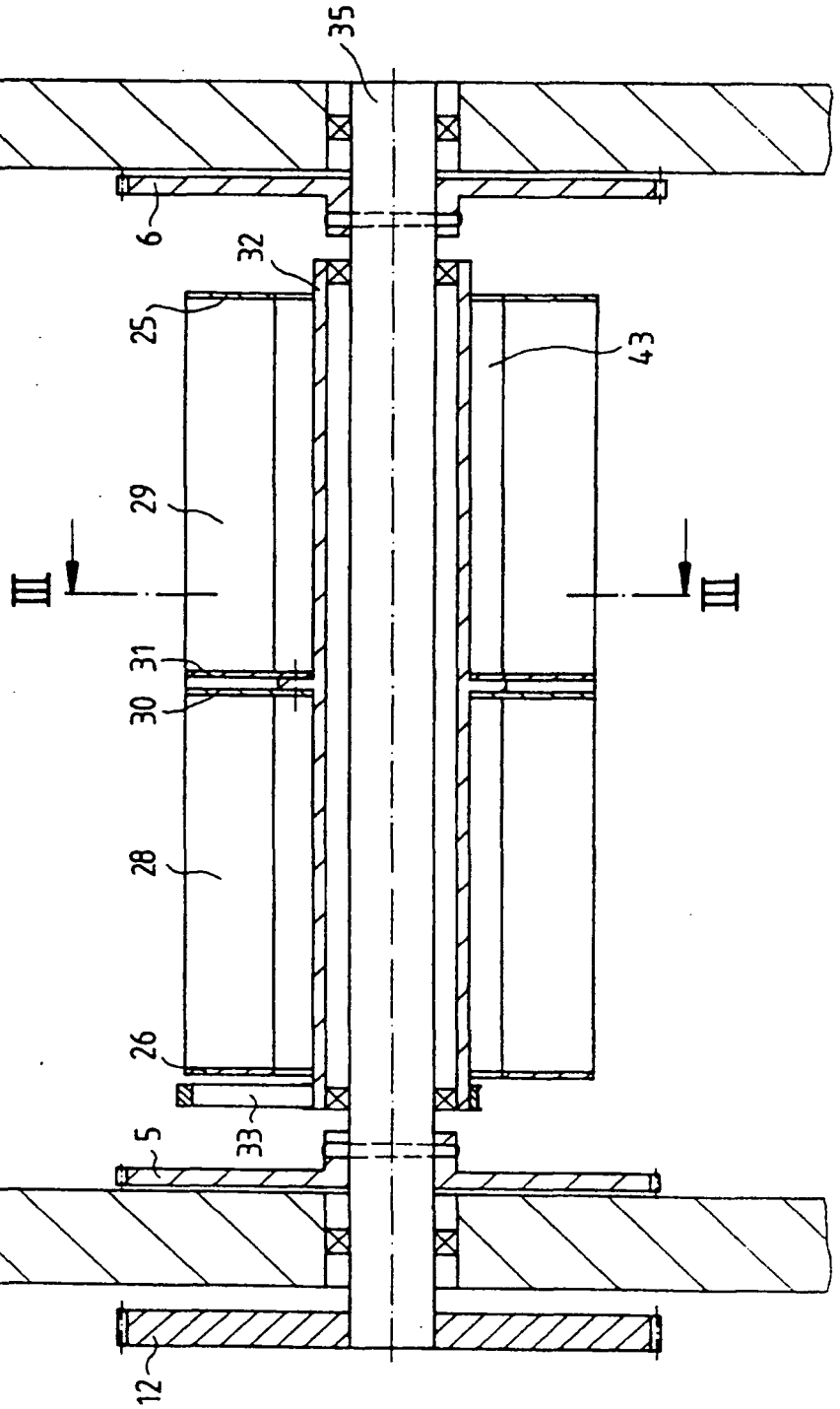
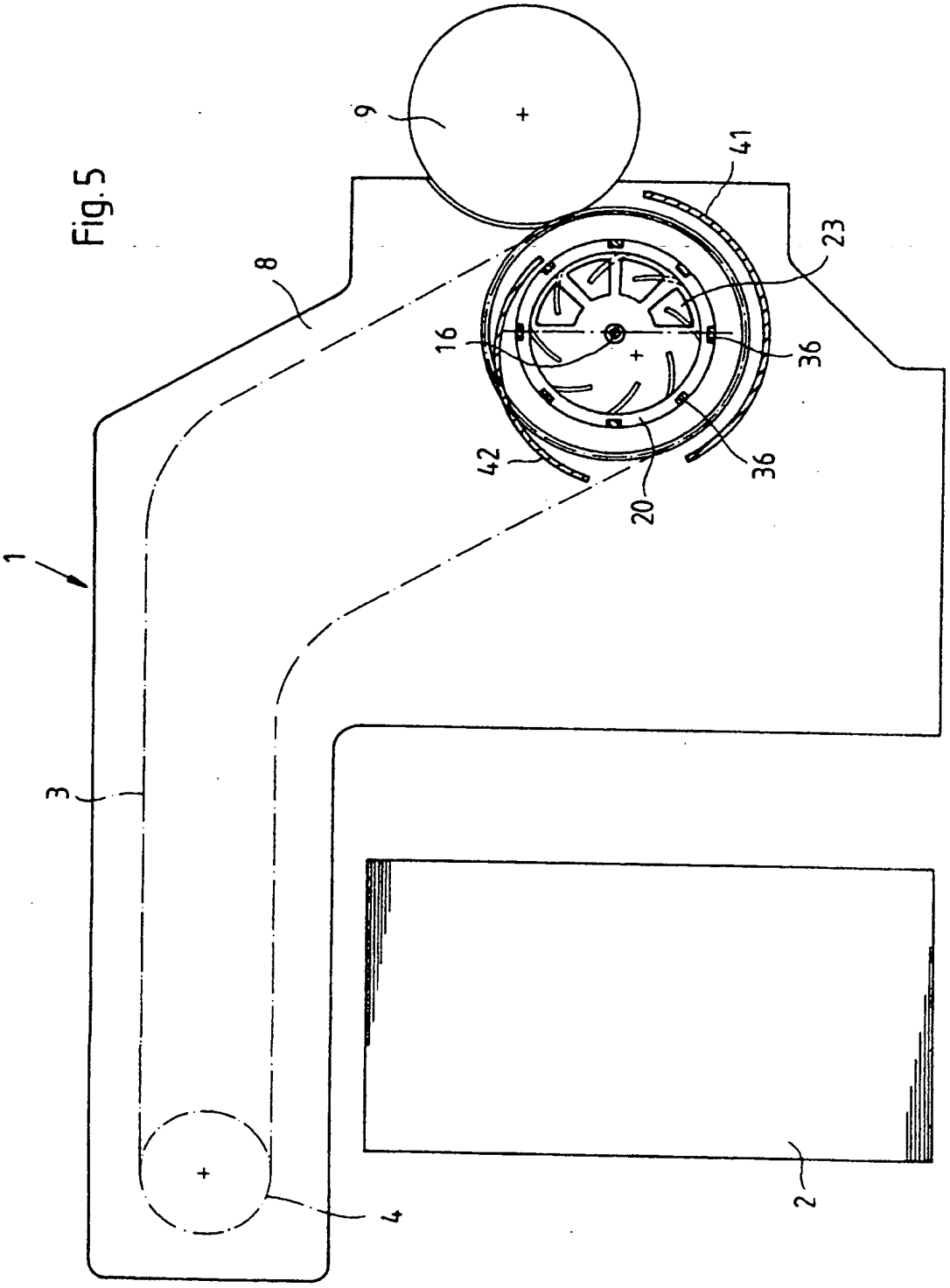



Fig.4

Fig.5



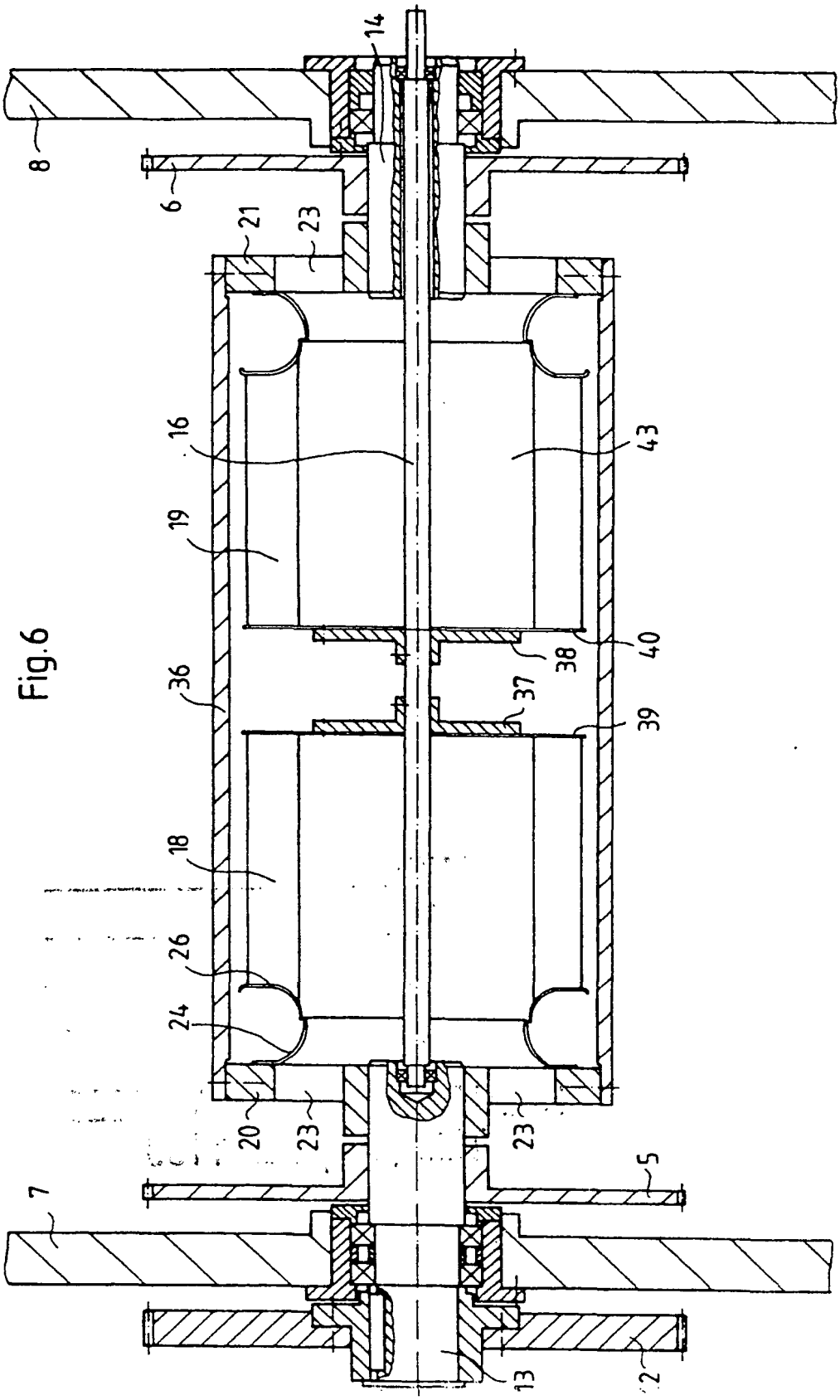



Fig.6

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